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Motor cortex alteration and maximal voluntary strength in COPD: Impact of non-rapid eye movement sleep desaturation

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Introduction Brain impairment is a major extrapulmonary effect of COPD and is involved in locomotor muscle weakness by reducing cortical motor output. Cerebrovascular O₂ reactivity (i.e. an increase in cerebral blood flow) protects the brain against the effects of chronic hypoxemia by preventing brain hypoxia. However, during non-rapid eye movement (NREM) sleep stages, patients are highly exposed to brain damage as this reactivity is abolished [1].

Objective This study assessed the involvement of NREM sleep desaturation in decreasing cortical motor output and muscle strength in COPD.

Method Twenty-nine patients with COPD were enrolled. On the basis of a polysomnography, they were divided in 2 groups: NREM desaturators (NREM_{Des}) if they spent more than 10% of NREM sleep time with SpO₂ < 90%, otherwise non desaturators (NREM_{NoDes}). Serum S100b concentration was measured on awakening as a marker of cerebral lesions. Quadriceps peak twitch (TwQ) was measured by femoral nerve stimulation and voluntary quadriceps strength during isometric maximal voluntary contractions (QMVC), respectively. Level of voluntary activation (LOA) and cortical motor output (VA_{cortical}) were assessed by interpolated twitches and magnetic stimulation of motor cortex, respectively.

Results Serum S100b was higher in NREM_{Des} ($p < 0.05$). In addition, LOA and VA_{cortical} were both reduced in NREM_{Des} ($p < 0.05$). However, there were no differences in TwQ and QMVC between the two groups of patients.

Discussion Higher serum S100b was consistent with higher cerebral lesions in patients with NREM sleep desaturation, which may explain the reduced voluntary activation and cortical output. Surprisingly, QMVC was not different between the NREM_{Des} and NREM_{NoDes} groups, suggesting compensatory mechanism(s) to ensure comparable muscle strength despite motor cortex alteration.

Keywords Voluntary activation; Electromyography; Muscle weakness; Cerebral cortex; Central nervous system

Disclosure of interest The authors have not supplied their declaration of conflict of interest.

Reference

- [1] Meadows GE, O'Driscoll DM, Simonds. et al. Cerebral blood flow response to isocapnic hypoxia during slow-wave sleep and wakefulness. *J Appl Physiol* 2004;97:1343–8.

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Obesity and handling: Unspoiled ability of lifting but lower aerobic capacities

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Background The rise of the prevalence of obesity in France is more important for blue collars (workers, farmers) than white collars, and these patients are particularly exposed to activities of lifting.

Objective The principal objective of this study is to search differences in abilities of maximal lifting, aerobic capacities and endurance of the spinal extensors, which are determinants of ability of lifting, between obese and non obese patients with chronic musculoskeletal pain.

Material and methods A progressive iso-inertial lifting evaluation, a Sorensen test and a cycloergometer exercise test with VO₂ measurement were performed on 321 patients hospitalized in the unit of Physical Medicine and Rehabilitation of the hospital of Château-Renault for rehabilitation for a chronic pain syndrome.

Results The maximum weight lifted during PILE test (in kilogram) was more important in obese patients ($n = 65$) than in non-obese patients ($n = 166$), and the difference was in the limit of significance ($p = 0.0472$). On the other hand, the maximal weight lifted during PILE test in percentage of body weight was more important in non-obese patients than in obese patients ($p = 0.0397$). There was non-significant difference in the relative cardiac cost between obese and non-obese patients for this test. There was no significant difference in the results of Sorensen test and relative cardiac cost of Sorensen test between obese and non-obese patients. On the other hand, the VO_{2max} and VO₂ at the aerobic threshold (SV1) were significantly lower in obese patients (respectively $p = 0.0001$ and $p = 0.0489$).

Discussion The ability of lifting keeps is unspoiled in obese patients, considering absolute value, but the aerobic capacities are lower than non obese patients, which shows a lower resistance to tiredness in obese patients, probably in relation to insulin resistance of skeletal muscle.

Keywords Obesity; Lifting; VO_{2max}; Chronic pain

Disclosure of interest The authors have not supplied their declaration of conflict of interest.

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The contribution of the association of isokinetic muscle strengthening exercises in a training protocol for obese women (about 80 cases)

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Objective To evaluate the contribution of combined training protocol involving aerobic exercises associated with the isokinetic strength training in obese women and to compare it to an aerobic training protocol alone.